

Name:

Date:

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**PART A** In the space on the left, write the letter of the term or phrase which **best** completes the statement or answers the question (1 mark each).

- \_\_\_\_\_ 1. This radiation releases electrons.
  - a. Alpha
  - b. Beta
  - c. Gamma
  - d. UV
  
- \_\_\_\_\_ 2. If an initial 40.00 g sample has a half-life of seven days, how much of it remains after 28 days?
  - a. 10.00 g
  - b. 7.50 g
  - c. 2.50 g
  - d. 5.00 g
  
- \_\_\_\_\_ 3. Rutherford's experiment lead to his discovery of ...
  - a. the nuclear fusion reactor
  - b. isotopes
  - c. protons
  - d. the decay series
  
- \_\_\_\_\_ 4. Mass number is calculated by adding together the numbers of ...
  - a. Protons and neutrons.
  - b. Isotopes and electrons.
  - c. Electrons and neutrons.
  - d. Protons and electrons.
  
- \_\_\_\_\_ 5. Alpha decay involves the release of ...
  - a. A helium atom.
  - b. A proton.
  - c. A neutron.
  - d. An electron.
  
- \_\_\_\_\_ 6. Some of the difficulties in inducing fusion reactions are achieving ...
  - a. The high temperature needed for the reaction to occur.
  - b. The high pressure needed for the reaction to occur.
  - c. Control of the high temperature the reaction produces.
  - d. All of the above.

- \_\_\_ 7. The stable product of radioactive decay is called ...  
a. An alpha particle.  
b. A daughter isotope.  
c. A parent isotope.  
d. A gamma ray.
- \_\_\_ 8. \_\_\_ discovered that materials that absorb neutrons from nuclear fission reactions can help control the chain reactions that usually follow.  
a. Marie Curie  
b. Enrico Fermi  
c. Ernest Rutherford  
d. Wilhelm Roentgen
- \_\_\_ 9. Nuclear weapons involve ...  
a. Fission.  
b. Fusion.  
c. Both fission and fusion.  
d. Neither fission or fusion.
- \_\_\_ 10. This type of radiation can be blocked by paper.  
a. Gamma decay  
b. Beta decay  
c. Alpha decay  
d. Alpha and beta decay

**PART B** In the space provided mark each of the following as true or false. (1 mark each)

- \_\_\_ 1. An electron is a product of alpha decay.
- \_\_\_ 2. Carbon rods are used to absorb neutrons in a nuclear fission reaction.
- \_\_\_ 3. Gamma rays can be blocked by paper.
- \_\_\_ 4. Radiocarbon dating utilizes carbon-12 and carbon-14.
- \_\_\_ 5. A half-life is a constant for any radioactive isotope.
- \_\_\_ 6. Nuclear fission involves combining two smaller nuclei into a more massive nucleus.
- \_\_\_ 7. Neutrons are involved in initiating chain reactions.
- \_\_\_ 8. Natural background radiation is harmful.
- \_\_\_ 9. Nuclear fusion is the process that occurs at the core of our Sun.
- \_\_\_ 10. Half-lives are the same for all isotopes.

**PART C** In the space provided, match each term or phrase with the best definition. (1 mark each)

- |                       |                                                                 |
|-----------------------|-----------------------------------------------------------------|
| ___ 1. Alpha particle | A. Used to control chain reactions in nuclear reactors.         |
| ___ 2. Fission        | B. With a type of reaction that occurs in nuclear power plants. |
| ___ 3. Gamma rays     | C. Has a mass of 0 and an electric charge of -1.                |
| ___ 4. Half-life      | D. Involves one reaction initiating another reaction.           |
| ___ 5. Fusion         | E. The most common nuclear reactor in the world.                |
| ___ 6. CANDU          | F. Has a mass of 4 and an atomic number of 2.                   |
| ___ 7. Beta particle  | G. Requires extreme temperatures and pressure to induce.        |
| ___ 8. Chain reaction | H. Have almost no mass at no charge.                            |
| ___ 9. PWR            | I. One of the safest reactors in the world and its Canadian!    |
| ___ 10. Cadmium rods  | J. The time required for half the nuclei in a sample to decay.  |

**PART D** Each of the following questions requires a short answer.

1. Describe the decay series of uranium-238. (3 marks)
  
  
  
  
  
  
  
  
  
  
2. List and describe three factors that make it difficult for humans to start and control fusion reactions. (3 marks)

3. What reaction occurs in a CANDU reactor? Why are they so efficient in energy production? How else do they produce energy? Why are they amongst the safest reactors in the world? (4 marks)

**PART E** Complete the following radiation reactions and classify each reaction as producing alpha, beta, or gamma radiation. (2 marks each)

